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| 09/898,469 | 07/05/2001 | Gang Paul Chen | ChenInterleave | 8152 |

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EXAMINER

JUBA JR, JOHN

ART UNIT PAPER NUMBER

2872

DATE MAILED: 02/27/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/898,469

Applicant(s)

CHEN ET AL.

Examiner

John Juba

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on 04 December 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☐ Claim(s) 1-113 is/are pending in the application.
- 4a) Of the above claim(s) 71-113 is/are withdrawn from consideration.
- 5) ☐ Claim(s) 24-33 and 42-57 is/are allowed.
- 6) ☐ Claim(s) 1-23, 34-39, 65 and 68-70 is/are rejected.
- 7) ☐ Claim(s) 40, 41, 58-64, 66, and 67 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on 10 December 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s) _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 8 6) ☐ Other:

DETAILED ACTION***Election/Restrictions***

Applicant's election with traverse of claims 1 - 70 in Paper No. 10 is acknowledged. The traversal is on the ground(s) that the restriction requirement provides no basis for claim selection, and as such does not comply with accepted Office practice. This is not entirely persuasive because MPEP 809.02(a) permits identification of species by figures, by examples, by mechanical means, by material, or *by other distinguishing characteristic of the species* (not "claims"). Identification (grouping) of *the claims* by the examiner would be required only if the species cannot be "conveniently identified" in the foregoing manner. Thus, the examiner erred only if the distinguishing characteristics relied upon constitute an inconvenient means of identifying the species.

Given Applicants' greater familiarity with the operation of the various embodiments, and given that Applicants' have read and understood the claims, it was believed that Applicants could identify which of the recited elements cooperate to implement the various inventive concepts described in the restriction requirement. That is, the examiner not only believed the "distinguishing characteristics" relied upon to be a "convenient" means of identifying the species, but also believed that the most appropriate claim grouping would result from Applicants' involvement. Although the examiner does not necessarily agree with Applicants' grouping, the *bona fide* attempt to reduce the number of species for examination is noted with appreciation. Rather than further delay examination, the examiner accepts the proposed grouping.

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Claims 71-113 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected invention, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in Paper No. 10.

Information Disclosure Statement

Applicants' Information Disclosure Statement, filed March 6, 2002, contains a reference not in the English language (G. P. Katys, et al). The examiner relies upon the description in paragraph [009] of the instant specification as being a statement of relevance by the person designated in 37 CFR § 1.56(c).

Claim Objections

Claims 58 – 64 are objected to because of the following informalities: In claim 58, there is no antecedent basis for “the delay line elements” (lines 8 – 9). Appropriate correction is required. Claims 59 – 64 inherit the same deficiency through their dependency from claim 58.

Claim Rejections - 35 USC § 112

Claims 1 – 23, and 68 – 70 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

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Claim 1 is indefinite because it does not end with a period. It is not clear how the claim is to be further limited by any text that may be missing. Claims 2 – 23 inherit the same defect through their dependency from claim 1.

Claim 9 is further rejected as also not ending with a period.

Claims 68 – 70 are incomplete or confusing as to the cooperation of elements. It is not clear how the factor "n" cooperates with the other recited features, and it appears that the descriptive text is missing.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 14, and 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Cimini, Jr., et al. Referring *for example* to Figure 22 and the associated text, Cimini, Jr., et al disclose an apparatus with synthetic birefringence for modifying the transmission characteristics of an input optical beam. At one wavelength (frequency) the beam is transmitted with one polarization state; at another wavelength, the beam is transmitted

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with a second, orthogonal polarization state. The characterization of the apparatus as "a microoptic element" is not seen as imparting any positive structural characteristic as would distinguish over the prior art, which has all of the positive recited structure.

Claims 1, 10 – 12, 14, 16, and 65 are rejected under 35 U.S.C. 102(e) as being anticipated by Zhao (U.S. Patent Appl. Pub. No. US 2002/0048424 A1; hereinafter, "Zhao '424"). Referring *initially* to Figure 1 and the associated text, Zhao '424 discloses an apparatus with synthetic birefringence for modifying the transmission characteristics of an input optical beam, the apparatus comprising a first polarizing beam splitter (10), first (L_1) and second (L_2) beam paths, and a second polarization beam splitter (13) to recombine the first and second delayed beams into a single beam having interfering components defining a desired transmission characterization. The characterization of the apparatus as "a microoptic element" is not seen as imparting any positive structural characteristic as would distinguish over the prior art, which has all of the positive recited structure.

With particular regard to claims 10 – 12, Zhao '424 teaches provision of athermalized path lengths (para. [0070]), and well as provision of multiple stages, each preceded by a half-wave plate for tuning (para. [0068]). In the various examples, the delays are provided as integer multiples of the same delay, Γ .

With regard to claim 16, the illustrated embodiment includes a air spaced delay line ($L/2$) in one path (L_1).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 7, 8, 34 – 39, and 68 - 70 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao '424. As set forth above for claim 1, Zhao '424 discloses the invention substantially as claimed. However, Zhao '424 does not disclose the features variously recited in claims 7, 8, 34 – 39, and 68 - 70.

With particular regard to claim 7, Zhao '424 recognized that components such as the beam splitters would not disturb the path length differential, provided that these components were symmetrically arranged (para. [0070]). Thus, it appears that one of ordinary skill would have found it obvious to provide the beam splitters (10)(13) in equal lengths, in the interest of preserving the intended path length differential, as taught by Zhao '424. In so doing, it appears that one of ordinary skill would have appreciated that *ideally* the elements would be of exactly the same length. The particular accuracy with which this would be achieved practically would be determined in accordance with the birefringence of the beam splitters and the available technology. Thus, it appears that one of ordinary skill would have arrived at an accuracy of $\pm 250 \mu\text{m}$, through only routine experimentation in applying the principles of Zhao '424.

With regard to claim 8, one of ordinary skill would have appreciate that that length of the beam splitters (10)(13) of Zhao '424 would have been determined in

accordance with the birefringence and intended walk-off separation. Thus, barring any *unexpectedly* improved result, it appears that one of ordinary skill would have arrived at a length of 6 – 10 mm through only routine experimentation and optimization of the variables.

With particular regard to claims 34 – 40 Zhao '424 teaches that the two path length segments can have the same physical length, and can have an optical path length difference imparted by use of different refractive materials (para. [0075]). Thus, Zhao '424 discloses the invention substantially as claimed. However, Zhao' 424 does not disclose the accuracy of segment lengths as being within 1 μm of the calculated lengths.

Zhao '424 recognizes that the path lengths are related to the channel spacing (para. [0069]). Since Zhao '424 proposes operation over DWDM optical channels spaced as closely as 12.5 GHz apart, one of ordinary skill would have appreciated that for wavelengths customarily used in optical communications, the corresponding difference in path lengths could easily be a fraction of a micron. Thus, it appears that one of ordinary skill would have arrived at the recited precision path lengths, through only routine discovery of a workable range.

With regard to claim 35, Zhao '422 discloses multiple stages, each with athermalized optical paths, but does not disclose the particular difference in refractive indices or overall path lengths among the two paths. Nonetheless, it appears that in achieving the desired temperature characteristics, one of ordinary skill would be left with a limited selection of refractive materials exhibiting the necessary thermal expansion,

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thermo-optic, and transparency characteristics. Accordingly, it is believed that one of ordinary skill would have found it necessary to employ refractive index differences in excess of 15% and overall path lengths of less than 20 mm through the process of selecting known materials suitable for the intended use, and adapting the material lengths to achieve the desired temperature stability. As to the recitation of the ITU grid, it is believed that through the recitation of the 100 GHz, 50 GHz, 25 GHz, and 12.5 GHz channel spacings, one of ordinary skill would at once have envisaged the ITU grid. If such is not the case, then it would at least have been obvious to select the ITU grid, in the interest of providing a DWDM component compatible with systems commonly in use, such as those operating on an ITU grid spacing.

With regard to claims 68 – 70, Zhao '424 discloses the invention substantially as claimed, included use of multiple stages, and further suggests operation over 100 GHz, 50 GHz, 25 GHz, and 12.5 GHz channel spacings (para. [0010]). Thus, it is believed that one of ordinary skill would have arrived at the recited arrangement of phase delays through only routine discovery of the workable ranges suitable to achieve these channel spacings.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao '424, in view of Official notice. As set forth above for claim 1, Zhao '424 discloses the invention substantially as claimed. However, Zhao '424 does not disclose the beam splitters as being made from YVO_4 , as recited

With regard to claim 9, Zhao '424 does not disclose the beam splitters as being fabricated from crystalline YVO_4 , as recited. The examiner takes Official notice of the fact that it was well-known to fabricate beam splitters from YVO_4 , where it was desired to "walk-off" components of mutually orthogonal polarization. YVO_4 was often selected for use at optical communication wavelengths for its transparency and higher birefringence. It would have been obvious to one of ordinary skill to fabricate the walk-off beam splitters (10)(13) of Zhao '424 from YVO_4 , in the interest of selecting a known material suitable for use at the communications wavelengths of Zhao '424. It has been held that the selection of a known material based on its suitability for its intended use supports a *prima facie* finding of obviousness. *Sinclair & Carroll Co. v. Interchemical Corp.*, 325 U.S. 327; 65 USPQ 297 (1945). In the instant case, one of ordinary skill would have recognized that the higher birefringence of YVO_4 would have permitted the same walk-off distance to be achieved over a shorter length than provided by, for example LiNbO_3 , and thus would have provided the rather obvious advantage of reduced assembly size.

Claims 2 – 6, 15, and 17 - 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhao '424, in view of Shirasaki (U.S. Patent number 5,982, 488). As set forth above for claims 1 and 16, Zhao '424 discloses the invention substantially as claimed. Further, Zhao '424 teaches that the two path length segments can have the same physical length, and can have an optical path length difference imparted by use of different refractive materials (para. [0075]). Further, Zhao '424 remarks that temperature

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stability of the path lengths is of great importance (para. [0070]). Thus, Zhao '424 discloses the invention substantially as claimed, but does not expressly disclose "glass" for generating the optical path length differences.

In the same field of endeavor, Shirasaki discloses interferometer arrangements for optical filtering. Shirasaki teaches that, where it is desirable to provide a temperature stable optical path length, selection should be made from among numerous "optical glasses" (e.g., Col. 7, lines 43-47), which can be used alone or in combination to provide a path length that is substantially constant over a finite temperature range.

It would have been obvious to one of ordinary skill to employ "glass" and the refractive material of Zhao '424, in the interest of providing optical path lengths that are temperature stable, as suggested by Shirasaki, et al.

With particular regard to claim 3, Zhao '424 recognized that when the temperature characteristics of the system components were similar, the optical path length differences tended to be unchanged by temperature variation (para. [0072]). Thus, it appears that selection of glasses with similar temperature characteristics for use in the first and second paths, would have been a rather obvious means of assuring relative temperature independence of the corresponding path lengths.

With particular regard to claims 5 and 6, Zhao '424 recognizes the difference in refractive indices to effect the tuning of the apparatus. Thus, it appears that the particular selection of at least a 15% difference in refractive index, or indices of 1.5 and 1.9 would have been a rather obvious matter of determining the optimum or workable range to achieve the intended result.

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With regard to claim 15, Shirasaki teaches the use of two glasses for athermal response. It appears that the particular selection of the recited path length in air would have arisen through only routine optimization of the overall path differences.

With regard to claims 18 and 19, Zhao'424 recognizes that the apparatus can be used to provide dispersion (para. [0071]). Thus, it appears that one of ordinary skill would have found it obvious to tailor the dispersion to achieve compensation of the system in which it is used.

Allowable Subject Matter

Claims 24 – 33 and 42 – 57 are allowed. Subject to the aforementioned objectionable informalities, claims 58 – 64 are allowable over the prior art.

Claims 40, 41, 66, and 67 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 13 and 20 - 23 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art, taken alone or in combination, fails to teach or to fairly suggest

in combination with the splitter and delay arrangement, the provision of a second quarter-wave or three-quarter wave plate as part of the phase shifting tuning structure *in each of the first and second beam paths*, as recited in claim 13;

in combination with the non-birefringent delay arrangement, the particular provision of five beam splitters to provide the recited upper and lower beam pairs of different polarization, in the geometry recited in claim 20;

in combination with the non-birefringent delay arrangement and wave plate tuning, the particular provision of glass elements 8 – 16 mm in length to provide an overall assembly less than about 15 cm in length, as recited in claim 40;

in combination with the non-birefringent or polarization independent delay arrangement and the combining arrangement, the provision of a polarizing beam splitting arrangement to provide two beam pairs of different polarizations, in the manner recited in claims 24, 42, 48, or 58; or

in combination with at least two stages of non-birefringent elements providing differential delay and waveplate phase tuning, the provision of polarization beam splitting means to direct at least two beam pairs through the stages, as recited in claim 66.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Xie, et al (Patent Application Pub. US 2002/0154850 A1) disclose optical filters comprising cascading stages imparting a synthetic birefringent delay.

Xie, et al (Patent Application Pub. US 2002/0154845 A1) disclose optical filters comprising cascading stages imparting a synthetic birefringent delay.

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Zhao (Patent Application Pub. US 2001/0053024 A1) discloses an apparatus for synthesizing a birefringent effect with isotropic materials.

Fee, et al disclose a PMD compensator comprising a polarizing beam splitter, incremental delay stages, and a polarizing beam combiner.

Henry, et al disclose an optical filter comprising at least two stages of non-birefringent delay material.

Refregier, et al disclose a variety of optical time delay geometries employing polarization switching.

DeJule, et al disclose several arrangements of cascaded optical delay stages employing polarization switching.

Kebabian discloses a polarizing filter employing several stages imparting differential delay.

Kyo Inoue, et al (*J. Lightwave Techn.*) disclose a four-port optical filter comprising at least two delay stages of (ideally) non-birefringent material, and discuss the effect of birefringence in the device.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (703) 308-4812. The examiner can normally be reached on Mon.-Fri. 9 - 5.


If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cassandra Spyrou can be reached on Mon.- Thu., 9 - 5.

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The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9318 for regular communications and (703) 872-9319 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

John Juba


Primary Examiner, GAU 2872

February 21, 2003